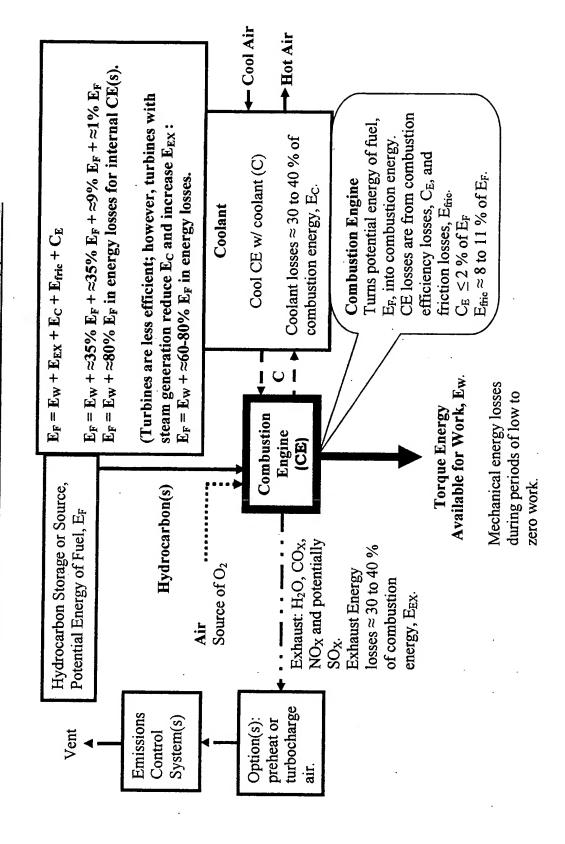
Figure 1
WCT Symbols in Flow Diagrams and in Figures 1 through 23A

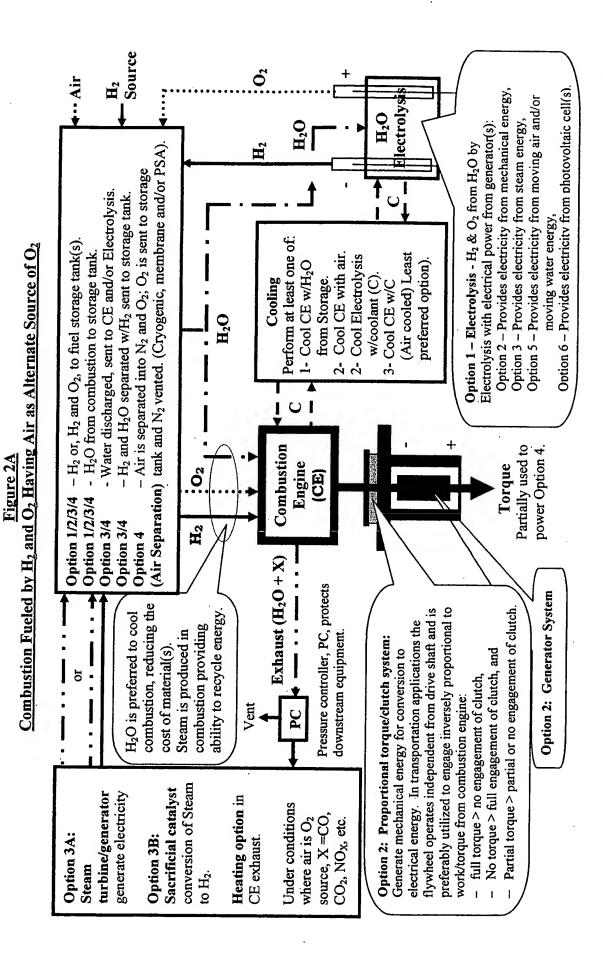
Symbol	Description	Notes
Combustion Engine (CE)	Combustion Engine	CE can be any combustion design as is known in the art, i.e. internal combustion engine, turbine, furnace, etc. CE combines fuel and ignites fuel with a spark generation device. Fuel is most preferably O <sub>2</sub> , H <sub>2</sub> and H <sub>2</sub> O. Fuel is preferably O <sub>2</sub> and H <sub>2</sub> . Fuel can be used in combination with air.
	Gas Compressor	Used in Cryogenic Refrigeration. Designs are plentiful in the art. Compressor symbols: A = Air, D1 = First Distillation, D2 = Second Distillation, O1 = O2, H1 = H2, O = O2 Storage and H = H2 Storage.
<b>&gt;</b>	Joule-Thompson Expansion Valve	Two types are normally used in the art –  1. An expansion valve, 2. A cylinder.
	Separation (Distillation Column)	Diameter and Height dependent upon separation efficiency and loading. Separation efficiency dependent upon compounds separated and column packing. Distillation Temperatures are relative to Separation Operating Pressure.  Depending on the desired O <sub>2</sub> purity, the second O <sub>2</sub> /N <sub>2</sub> separation column is optional.
Q X'fer	Heat Exchanger to cool compressed gases	During normal operation, it is preferred that the waste $N_2$ is coolant. Depending upon design, upon start-up water may be necessary for an efficient start-up.
	Cryogenic Storage Tank	Tank is to be made of materials known in the art to withstand liquid cryogenic temperatures/pressure of O <sub>2</sub> and/or H <sub>2</sub> . Tank may have refrigeration loop per Figure 13, which operates of off at least one of: the combustion engine, a battery and a fuel cell.
T +	Turbine	Depending upon application, turbine is to be turned by steam, air or water movement.  Turbine is preferred to generate electricity, preferably driving a generator and/or alternator. It is most preferred that the electricity performs electrolysis.
PC	Pressure Controller	Pressure controller can be of any design as is known in the art. PC protects downstream equipment from pressure surges. In high pressure surge situations, PC vents to the atmosphere.
Q	Energy in the form of heat	Energy is transferred (managed) during many methods, processes and systems of this invention.
C O N T	Fuel Mixture Controller	H <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> O, air bypass and engine coolant. Controller manages fuel mixture ratios. H <sub>2</sub> O ratio in combustion is managed depending upon combustion temperature and/or engine temperature. Air bypass is to be managed depending upon O <sub>2</sub> tank level. Engine coolant loop dependant on high engine temperature.

Figure 1A
WCT Symbols in Flow Diagrams and in Figures 1 through 23A

Symbol	Description	Notes
	Clutch	Used to transfer E <sub>W</sub> to at least one of a flywheel and a generator. Clutch preferably engages during periods of little to no work and disengaged during periods of work. Design and assembly to be as known in the art.
	Flywheel	Used to store rotational kinetic energy during periods of little to no work; rotational energy to be utilized during periods of work.
	Generator	Used to generate electrical energy. Generator can be of the type to generate an alternating current (A/C), such as in power generation applications or a Dynamo to generate a direct current (D/C) to power electrolysis. A/C current can be turned into D/C with an A/C to D/C converter and D/C can be turned into A/C with a D/C to A/C converter.
- H <sub>2</sub> O Electrolysis	Electrolysis	Electrolysis of H <sub>2</sub> O to O <sub>2</sub> and H <sub>2</sub> is to be performed. Electrolysis is to be performed by methods and systems known in the art of electrolysis. It is most preferred that an electrolyte be present in the H2O to further electrolysis and the efficiency of electrolysis. It is preferred that the electrolysis unit be cooled.
	Air Line	Line primarily contains air.
••••••	O <sub>2</sub> Line	Line primarily contains O <sub>2</sub> .
	N <sub>2</sub> Line	Line primarily contains N <sub>2</sub> .
	H <sub>2</sub> Line	Line primarily contains H <sub>2</sub> .
	H <sub>2</sub> O Line	Line primarily contains H <sub>2</sub> O.
	Products Line	Line primarily contains combustion products, preferably H <sub>2</sub> O, yet can be H <sub>2</sub> O and X, wherein X is N <sub>2</sub> , CO <sub>X</sub> and NO <sub>X</sub> and can contain SO <sub>X</sub> .
	Coolant (C) Line	Line symbol indicates flow of coolant, which is preferably used with electrolysis. C can be used with CE; however this is not preferred. C can be any type as is known in the art; coolant is preferred a mixture of water, glycol, corrosion inhibitor and dispersant.
	Control Line	Electrical or pneumatic line. Electrical wire carrying a small current, preferably 4 to 20 mA. Pneumatic line may carry a gas and/or a liquid under pressure.
	Flow Transmitter	Used in combination with control line and controller
	& Control Valve	(CONT.) to control flow of fuel and/or coolant (C)
+G	Coolant Radiator	Used to release heat from coolant and pump back to heat source. Preferably used for electrolysis. Preferably used to cool oil for CE. It is not preferred to cool CE.

Figure 2
Traditional Combustion - Combustion Fueled by Hydrocarbon(s) and Air





0 Option 5 - Electricity from moving air and/or water H<sub>2</sub>O From Storage ectroly Option 2 – Electricity from mechanical energy, Option 3 – Electricity from steam energy, energy, Option 6 – Electricity from photovoltaic cell(s).  $H_2O$ Filter  $\mathbf{H}_2$ H<sub>2</sub> to Storage and/or CE Liquefaction or chilling is optional for O2 and H2. It is preferred that cooling and/or liquefaction is performed at storage and warm O<sub>2</sub> and H<sub>2</sub> be used when available. Combustion Fueled by H2 and O2 with Air as Alternate- Electrolysis VOX'fer Combustion Ew Partially used to power at least one of compressor(s): Combustion Engine 0 (CE) 01, 0, N and H Torque, Exhaust (H2O + X(Bypass)) Vent OOZE O<sub>2</sub> during periods of low O<sub>2</sub>. Air is an alternate source of Vent H2O to Storage Vent -

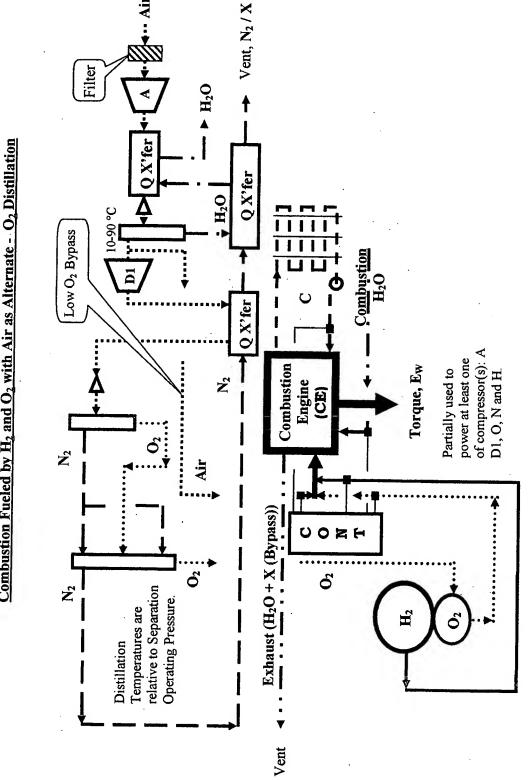
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Filter Air is an alternate source of O<sub>2</sub> during periods of low O<sub>2</sub>. Combustion H<sub>2</sub>O power at least one Combustion Torque, Ew of compressor(s): Partially used to Engine (CE) H1, O, N and H. O<sub>2</sub> Bypass Exhaust (H2O +X (Bypass)) Vent 002H Vent Converter Catalyst Vent  $\mathbf{H}_2$  $H_2$ 

Combustion Fueled by H<sub>2</sub> and O<sub>2</sub> with Air as Alternate - H<sub>2</sub> Catalysis

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Figure 5
Combustion Fueled by H<sub>2</sub> and O<sub>2</sub> with Air as Alternate - O<sub>2</sub> Distillation



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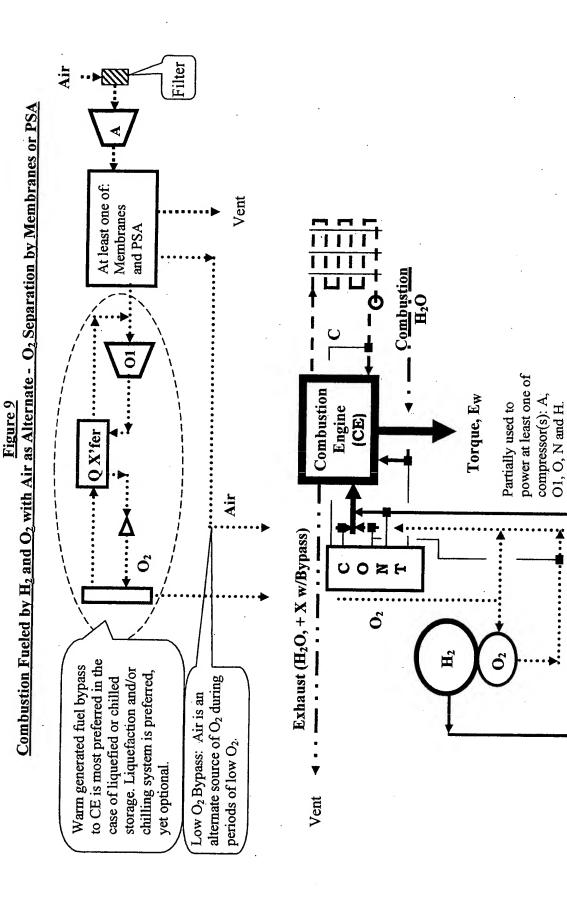
Option 6 - Electricity from photovoltaic cell(s). Option 2 - Electricity from mechanical energy, H<sub>2</sub>O from Storage O Option 5 - Electricity from moving air and/or lectrolys H,0 Option 3 - Electricity from steam energy, Filter Combustion Fueled by H<sub>2</sub> and O<sub>2</sub> with Air as Alternate - Electrolysis - H<sub>2</sub> Catalysis water energy, To H<sub>2</sub>. Liquefaction and/or chilling is preferred for Liquefaction or chilling is optional for O<sub>2</sub> and storage. Warm generated fuel bypass to CE is most preferred in the case of liquefied storage. Combustion at least one of compressor(s): O1, H1, O, N and H. Ew Partially used to power Combustion Engine (CE) Torque, Exhaust Vent OOZH Vent alternate source of O2 during PC Low O2 Bypass. Air is an periods of low O2. Converter Catalyst H H Storage  $\mathbf{H}_2$ H<sub>2</sub>O to  $\mathbf{H}_2$ 

Vent, ►H20 To O 0 Option 2 – Electricity from mechanical energy, Option 3 – Electricity from steam energy, Option 5 – Electricity from moving air and/or water lectrolysi Storage energy, Option 6 – Electricity from photovoltaic cell(s). Air ... H,0 from  $H_2O$ To H Filter AYQ X'fer Q X'fer  $H_2O$ 10-90 °C Combustion H<sub>2</sub>O  $H_2$ Q X'fer Low O2 Bypass 0 least one of compressor(s): Partially used to power at A, D1, D2, O, N and H. Combustion  $\mathbf{H}_2$ Engine (CE) •••••••• 0 Torque,  $H_2$ ,  $N_2$ Air Exhaust  $(H_2O + X (Bypass))$ **-+4** 0 OOZH 0 O  $H_2, N_2$ õ  $\mathbf{H}_2$  $H_2$  $\mathbb{H}_2$ O X'fer Storage H<sub>2</sub>O to Vent - $\mathbb{Z}^{5}$ +

Combustion Fueled by H<sub>2</sub> and O<sub>2</sub> with Air as Alternate - Electrolysis - O<sub>2</sub> Distillation

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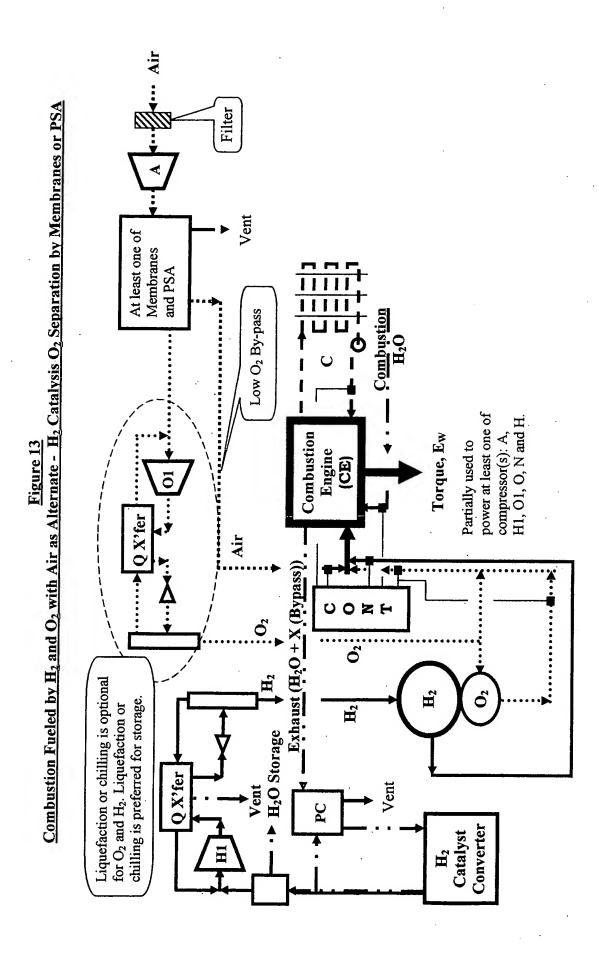


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Combustion Fueled by H<sub>2</sub> and O<sub>2</sub> with Air as Alternate - H<sub>2</sub> Catalysis during periods of low O2 tank level. Combustion H<sub>2</sub>O Air is an alternate source of O<sub>2</sub> least one of compressor(s): H1, O, N and H. Ew Partially used to power at Combustion Figure 14 Engine (CE) Bypass Low O<sub>2</sub> Torque, Exhaust (H2O +X (Bypass)) Vent OOZH PC H2O to Storage

Converter Catalyst

 $H_2$ 

Vent -

H

Air Air

Filter

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Ew Preferably used to power at least one of compressor(s): A, D1, O, N and H. Combustion Engine  $Z^2$ 17 of 28 (CE) Torque,

OOZH

0

H2O to Storage

Vent -

Vent

Filter

Low O<sub>2</sub> Bypass

Z

Z

Combustion Fueled by H2 and O2 with Air as Alternate - O2 Distillation

Figure 15

Q X'fer

10-90 °C

N<sub>2</sub> and X

Q X'fer

Q X'fer

Exhaust  $(H_2O + X (Bypass))$ 

 $H_2O$ 

Air

0

relative to Separation Operating Pressure.

Temperatures are Distillation

of compressor(s): A, O1, O, N and H. Preferably used to power at least one Combustion Engine 18 of 28 (CE) O X'fer Torque,

Exhaust (H<sub>2</sub>O, + X w/Bypass)

Õ

H<sub>2</sub>O to Storage

Vent -

Combustion H<sub>2</sub>O

; ;; (\*\*

Filter

Vent

Air

inadequate membrane

separation.

... Air

At least one of:

generated fuel bypass to CE is most preferred in the case of

liquefied or chilled storage.

Low O2 Bypass. Air is

an alternate source of O<sub>2</sub> during periods of low O2 tank level or

preferred for storage. Warm

Liquefaction or chilling is

Membranes and PSA

01

Combustion Fueled by H<sub>2</sub> and O<sub>2</sub> with Air as Alternate - O<sub>2</sub> Separation by Membranes or PSA

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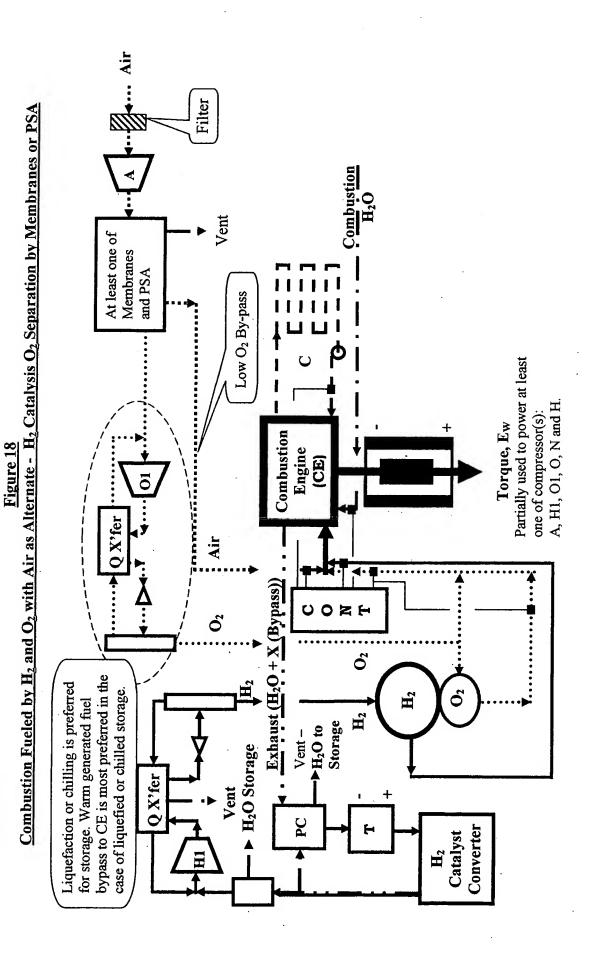
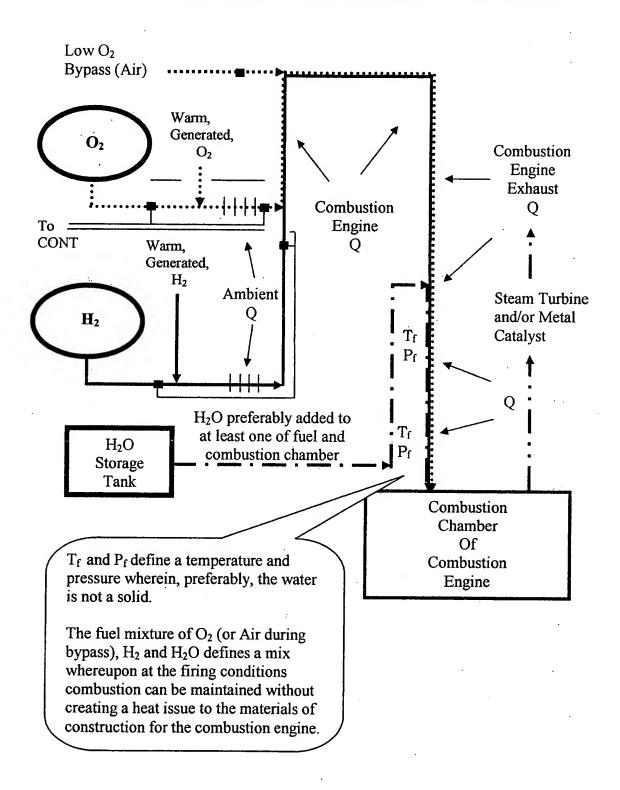
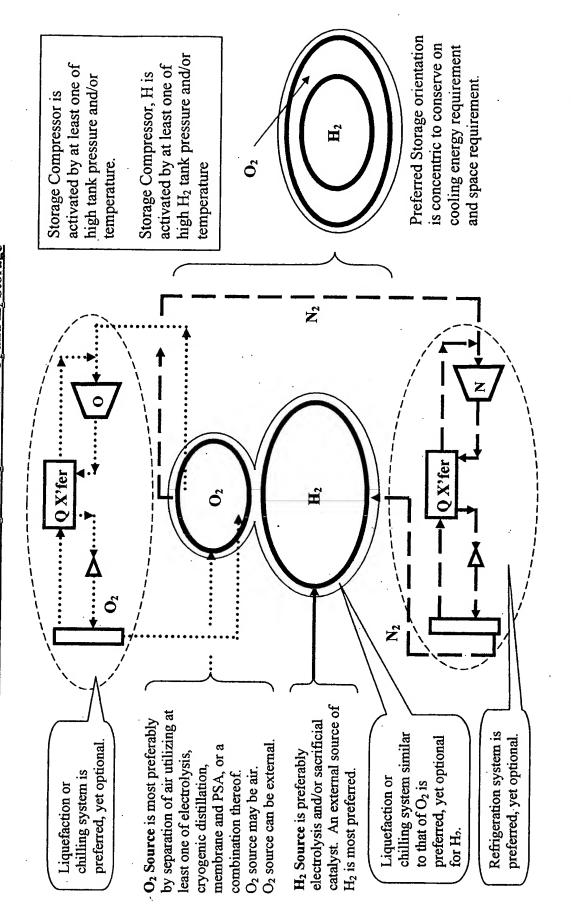


Figure 19
Combustion Fueled by H<sub>2</sub> and O<sub>2</sub> and/or Air - Fuel Preheating





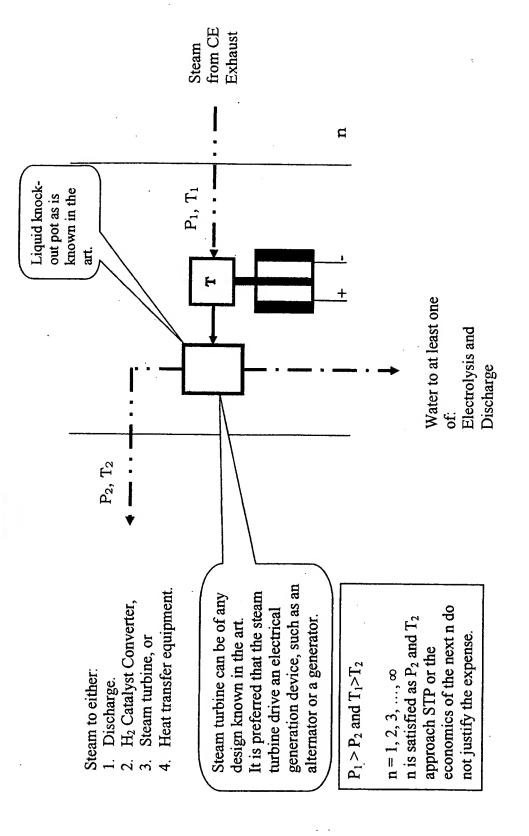
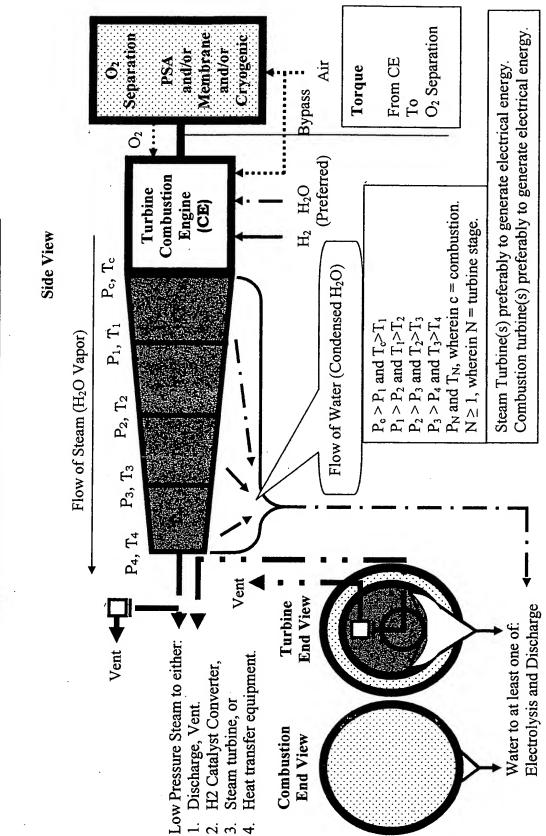
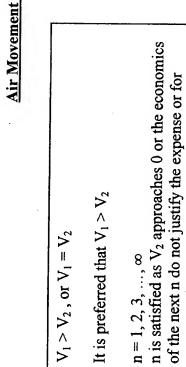


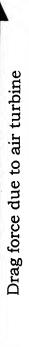
Figure 21A
In-Line Combustion and Steam Turbine Configuration(s)



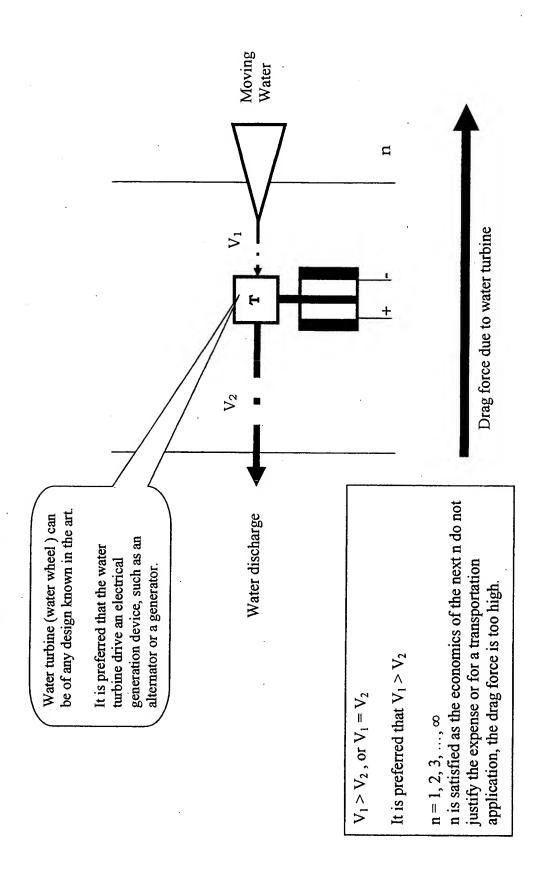


Moving generation device, such as an turbine drive an electrical Air It is preferred that the air Air turbine can be of any alternator or a generator. design known in the art. Filter and Distillation, 3. Filter and PSA, or 4. Filter and membrane. high (such would not be the case for a sail boat). transportation application, the drag force is too 1. Discharge.

Air to at least one of:



¤



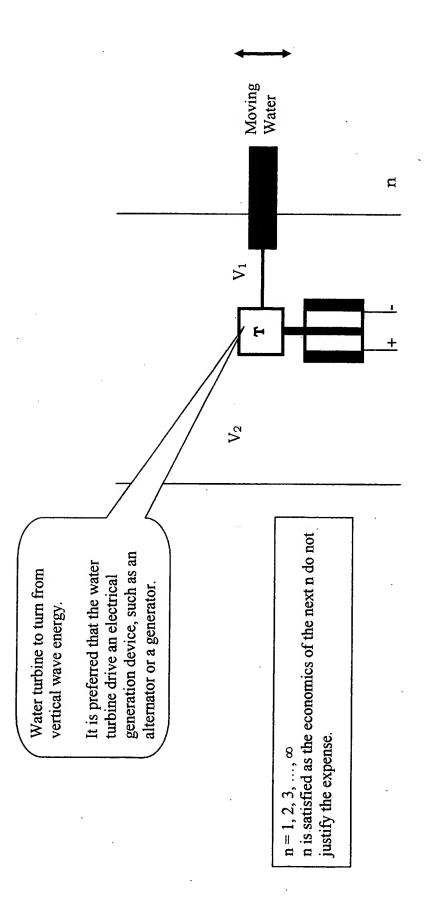


Figure 24
Pressure Control Configuration(s)

